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Comparative Study of Chlorophyll A on Several Rice Genotypes for Food Resilience Against Drought Stress

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Abstract

Drought stress is a major challenge in agriculture, especially in rainfed rice, which can reduce rice productivity and affect food security. This study analysed chlorophyll A levels in Inpago rice genotypes to evaluate their tolerance to drought stress. The genotypes tested included Inpago 1, Inpago 7 and Inpago 5. Chlorophyll A levels were measured using a spectrophotometer. The results showed variation in chlorophyll A levels, with Inpago 5 having the highest levels (2.73 mg/g), indicating better tolerance to drought stress. High chlorophyll A levels are associated with photosynthetic efficiency, so plants are better able to survive in dry conditions. This finding supports the importance of selecting resilient rice varieties for future food security. Genotypes with higher chlorophyll A levels, such as Inpago 5, should be prioritised in breeding programmes to improve the resilience of rice to climate change and water stress.

Keywords: *Chlorophyll A; Inpago Genotypes; Rice Productivity; Resilient*

Introduction

Drought stress is a major challenge in agriculture, particularly in rainfed rice. Reduced rice productivity due to drought can significantly affect food security [1]. Therefore, research to compare chlorophyll A in different rice genotypes is important to understand how genetic variation can affect plant resistance to drought.

Chlorophyll A is an important pigment in the process of photosynthesis, which allows plants to convert sunlight into energy [2]. High levels of chlorophyll A usually indicate good plant health and efficient photosynthetic capacity. In the context of drought stress, plants with higher chlorophyll A levels tend to be better able to survive and adapt to air stress [3].

Some rice varieties have been identified as having better tolerance to drought. For example, Silugonggo and Inpari 38 are known to be high-yielding varieties that are resistant to drought stress. Research shows that these varieties have not only morphological but also physiological adaptations that favour their survival in dry conditions [4]. This study aimed to analyse chlorophyll A levels in Inpago rice genotypes to evaluate their tolerance to drought stress.

Materials and Methods

This research was conducted to analyse chlorophyll A levels in different Inpago rice genotypes in relation to tolerance to drought stress. The research steps included: 1) Genotype selection: Several Inpago rice genotypes were selected based on their known drought tolerance traits, including Inpago 1, Inpago 7 and Inpago 5. 2) Chlorophyll A level testing: Chlorophyll A levels were measured using a spectrophotometer. Leaf samples were taken from each genotype at the vegetative stage and processed according to standard procedures [3]. 3) Determination of drought stress: Drought stress was applied by reducing the frequency of plant watering, simulating drought conditions. Soil moisture parameters were measured periodically to ensure appropriate stress levels [5]. 4) Data analysis: The data obtained were analysed using statistical analysis to compare chlorophyll A levels between genotypes. The correlation between chlorophyll A levels and tolerance to drought stress was assessed to determine the relationship between the two variables [6].

Results and Discussion

This study aims to analyse chlorophyll A levels in different Inpago rice genotypes in relation to tolerance to drought stress. The results showed that there were differences in chlorophyll A levels among the genotypes, viz: Inpago 1 with 1.18 mg/g, Inpago 7 with 1.34 mg/g and Inpago 2.73 mg/g. From these results, genotype Inpago 5 showed higher chlorophyll A levels, indicating a better tolerance to drought stress.

The high chlorophyll A levels in Inpago 5 may be related to its more efficient photosynthetic capacity, allowing the plant to maintain its metabolism even under drought conditions. According to previous studies, higher chlorophyll levels often fulfil plant tolerance to environmental stress, including drought [3]. Measuring chlorophyll A levels is an important indicator of plant health and adaptability.

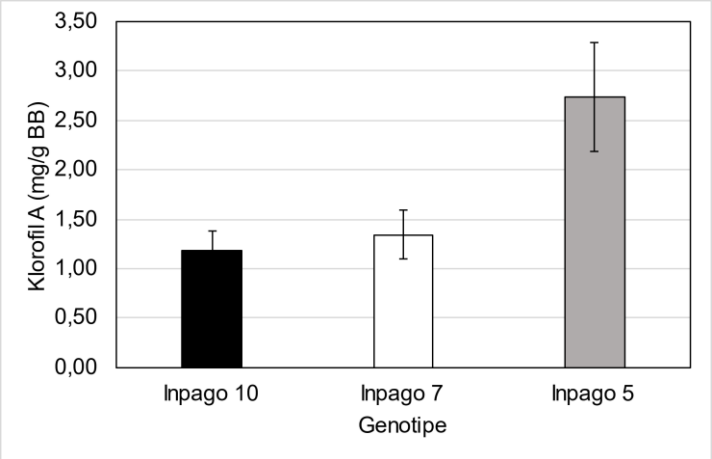

Figure 1. Chlorophyll A Yield Diagram (mg/FW) of several rice genotypes

Table 1. Chlorophyll Test

Genotype	470 nm	646 nm	662 nm	Chl A (mg/g FW)
Inpago 10	0.1681	0.1614	0.1672	1.59
Inpago 10	0.1467	0.1015	0.1041	0.98
Inpago 10	0.1127	0.1015	0.1041	0.98
Inpago 7	0.1959	0.1880	0.1916	1.81
Inpago 7	0.1031	0.0904	0.0923	0.87
Inpago 7	0.1051	0.0921	0.0938	0.89
Inpago 5	0.6161	0.5898	0.6152	5.84
Inpago 5	0.1575	0.1499	0.1513	1.43
Inpago 5	0.1099	0.0984	0.0992	0.93

Table 2. Chlorophyll A Test Results

Genotype	Chl A	Stdev	SE
Inpago 10	1.18	0.34679121	0.1962966
Inpago 7	1.34	0.53732538	0.24434161
Inpago 5	2.73	2.70315164	0.54804214

Chlorophyll A plays a role in the photosynthetic process. and plants that are able to maintain high chlorophyll levels under stressful conditions tend to perform better [6]. Therefore. genotypes with higher chlorophyll A levels can be prioritised in rice breeding programmes to meet the challenges of climate change. especially in drought-prone areas. This finding supports the hypothesis that plants with higher chlorophyll A levels are better able to adapt and survive under drought conditions [3. 6]. Therefore. genotypes with higher chlorophyll A content. such as Inpago 5. can be prioritised in breeding programmes to improve the resilience of rice to climate change and water stress.

Conclusion

This study is important for understanding how genetic variation affects rice resistance to drought stress. The results can help in the selection of more resilient rice varieties. thereby supporting future food security. This study showed that chlorophyll A levels varied among the Inpago rice genotypes. with Inpago 5 having the highest value at 2.73 mg/g. Higher chlorophyll A levels in these genotypes indicate better tolerance to drought stress. which may be related to better photosynthetic efficiency.

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